organization in general, and not (as originally proposed by Liberman, 1975) an explicitly temporal structure. 'The earliest formulation of metrical theory identified the organizational structure of an utterance with the phonetic manifestations of rhythm in its durational pattern, and HENCE DID NOT GENERALIZE THE ORGANIZATIONAL FUNCTION TO TYPES OF ACCENT SYSTEMS OTHER THAN STRESS ACCENT... There is, however, nothing inherent in the representational mechanism provided by the theory that precludes a more general interpretation' (26–27, emphasis added). The implications of this view for both metrical theory and for the distinction between stress and non-stress accent are extensively explored in Chapters 2 and 3.

There are three distinct respects in which this book is a valuable contribution. First and most basically, I think Beckman's stress-accent hypothesis is correct, certainly in its broad outlines and probably even in a good many of the detailed consequences it implies for metrical theory. Second, the book is an impressive work of scholarship. The author's mastery of the literature that bears on her hypothesis – ALL the literature – gives her access to insights that transcend any single theoretical school or methodological tradition. (The connection she draws between the European structuralists' notion of the culminative function of accent and the notion of hierarchical organization developed in metrical phonology is a particularly striking example of this cross-fertilization.) Third, the book is a rich extended illustration of the possibilities of what Beckman has called 'laboratory phonology'. It seems all but certain that laboratory work will become an integral part of phonological research in the next decade. Beckman's book shows us how such work should be done, and why it matters.

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Ralph Grishman, *Computational linguistics*. Cambridge: Cambridge University Press, 1987. Pp. viii + 193.

Grishman's book, one of C.U.P.'s welcome series 'Studies in Natural Language Processing', aims to provide newcomers to the field with a survey of the principal areas of interest. The book is structured accordingly, a brief introductory chapter being followed in turn by chapters on syntactic analysis, semantic analysis, discourse phenomena, and text generation. It is intended for 'readers with some background in computer science and finite mathematics', and presupposes little if any knowledge of linguistics. However, few readers of this journal lacking the specified background should experience much difficulty with the concepts discussed there.

For Grishman, the value of computational linguistics lies chiefly in the practical aspects of Natural Language Processing (NLP), rather than any application of its techniques to the investigation of the nature of language itself. Some of the methods described are therefore questionable from the theoretical point of view, but nevertheless often represent attempts to find efficient solutions to particular problems. There are numerous references to actual NLP systems, and, while they serve well to emphasize the essentially practical nature of the undertaking Grishman wishes to present, the fact that many of the systems cited date back to the seventies (and sometimes earlier) means that he often seems to be answering not the question 'What is Computational Linguistics?' but 'What has Computational Linguistics been?' The rationale for this strategy, as set out in the Introduction, is that new reseachers risk reinventing the wheel, and will be helped to an understanding of modern research efforts by acquaintance with what has gone before. This is true enough, but there is some danger of going to the other extreme and, by ignoring more recent work, giving a false impression of current methods.

The historical bias emerges most clearly in the long second chapter on syntactic analysis. This opens with a helpfully clear tour of the Chomsky hierarchy of grammar types, beginning with the Type-0 or unrestricted rewriting systems, called here 'phrase-structure grammars'. While this usage is not uncommon in formal language theory, it might have been worth mentioning

that theoretical linguists generally reserve this term for the Type-2 or context-free grammars. The latter class is exemplified by a rather lengthy fragment constructed on the Linguistic String theory of Harris (1962); this seems an eccentric choice, probably determined by the author's association with a long-running project at New York University which takes Harris' work as its linguistic starting point. Antiquity is no objection, but it is unfortunate that the reader's attention is not drawn to the unorthodox assumptions made concerning both constituency and the inventory of categories available to the grammar. Also in this chapter is a long section on the use of transformational grammars in computational linguistics. Here a pre-*Aspects* model of grammar is employed for illustration, complete with singular and binary, optional and obligatory transformations, affix-hopping and a passive rule. As a presentation, it is fine, but one cannot help wondering why it should have been included at all. The measures required to make grammars of this kind a remotely acceptable basis for implementation (measures described by Grishman), coupled with the fact that they have long been abandoned in theoretical circles, surely mean that no contemporary student of computational linguistics need be troubled with them; they are hardly prime candidates for reinvention, after all. From the point of view of organization, this chapter could have been improved by a stronger separation of material on grammatical description from material on parsers. As it stands, the reader is led from the transformational model via the Augmented Transition Network formalism and the use of Prolog to parse with Definite Clause Grammars back to metarules in GPSG, and may not always appreciate the difference.

The chapter dealing with semantic analysis is far more coherent, and more effective. In the course of illustrating how representations of meaning can be derived from sentences, Grishman discusses such topics as the predicate calculus, restricted quantification, the incorporation of selectional restrictions into a syntactic description to define a 'sublanguage', and the resolution of anaphora. He shows how logical forms may be produced from the underlying structures of the transformational grammar introduced in chapter two, but the general approach, with suitable modifications, is applicable to other types of syntax. The account of Webber's (1979) approach to the interpretation of anaphoric NPs is especially useful. Exactly how meaning representations of the kind described here might be employed in, for example, question-answering or translation programs receives only very brief coverage. As the author points out, NLP applications involve techniques that go beyond what might be considered the realm of computational linguistics proper.

Sentence-bound aspects of language are far better understood within computational linguistics than those involving the structure of discourse and implicit information. World knowledge is a major problem in Artificial Intelligence generally, and the chapter on discourse analysis describes concisely several proposals for adequate knowledge representation formalisms in NLP. The final chapter suffers inevitably from the relatively undeveloped state of natural language generation, but represents fairly the issues that must be faced by 'the poor cousin', as the author calls it. Here, too, the transformational approach predominates, sentence generation being presented primarily as a mapping from logical form to deep structure, and thence to the surface string. The more challenging task of text generation, with the attendant problems of textual coherence, is also mentioned, albeit in the form of 'preliminary experiments'.

Grishman's *Computational linguistics* cannot claim to be the definitive student text on the subject; many of the areas which it covers are handled most competently, and the wealth of references to real-life systems make it a useful guide to further reading, but it is a slim volume, and the attempted coverage is too broad to permit detailed accounts of many of the problems and methods attracting attention in the field. With the exception of the short passage on Prolog, it lacks any guidance on how to turn the ideas it contains into programs, and so may leave those who approach the field from the direction of non-computational linguistics frustrated. As an introductory overview, however, it does pretty well and should enable its intended readers to tackle more ambitious works, such as that of Winograd (1983), the papers in the Grosz *et al.* (1986) collection, or the other books in its series.

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Jeffrey Heath, *Ablaut and ambiguity: phonology of a Moroccan Arabic dialect*. Albany: State University of New York Press, 1987. Pp. 336.

This is possibly the fullest phonological description of a variety of modern colloquial Arabic yet to appear, impressive both in the range of phenomena studied and in the rigour of theoretical analysis achieved. Major issues dealt with include: the modelling of productive derived stem shapes ('ablaut'), such as verbal nouns, participles, plurals, diminutives, professional nouns with or without associated affixes; play speech, involving the reordering of consonants and sometimes suffixation; constraints on consonant sequences in stems; consonantal assimilation, gemination (sometimes accompanied by labialization), and hiatus; the status and function of full and short vowels and semivowels; and pharyngealization (the elusive quality of 'emphasis' traditionally associated with a set of consonants in Arabic). The detailed index, cross-references and final recapitulation should enable readers to find their way through the mass of data and argumentation with relative ease. Start with the last chapter for a flavour of the approach and the major issues under discussion. The model adopted maps input stems onto 'templates' or fixed patterns of consonant and vowels, sometime preceded or followed by a variable sequence ('projection'). The mapping may involve 'fillers' (usually semivowels) being supplied to fill an empty slot in the output template, or one input segment being extended to more than one in the output. Additional, more familiar rules, such as those of syncope and epenthesis, may follow. The model has great appeal for a language like Arabic, where the number of local rules required to link such forms would be large and the rules themselves complex and often limited in scope.

Within this broad framework the approach is refreshingly undogmatic. Often a variety of analyses are considered, and the author does not feel bound to commit himself wholly to any one solution. The data are not presented primarily to support a particular theoretical point, nor is there protracted agonizing over alternative formatizations. The foregrounding of data in this way surely points a lesson to many working in the field of theoretical phonology.

The chapter on pharyngealization is a clear illustration of the author's approach. He gives a concise summary of possible models for describing the phenomenon, and suggests that in this particular variety we have spreading of pharyngealization from a focal consonant or consonants within the stem, most strongly in a leftwards direction. But he also shows how trends in the data suggest that it is in the process of becoming something more like a prosodic feature of the stem as a whole, and that a suprasegmental or vowel-harmony model may eventually prove to be a more appropriate solution.

Throughout, the integration of diachronic and synchronic data sheds light on the processes of phonological change. On several occasions we see how the native speaker, faced with a number of competing analyses, hesitates between two or more conceptual representations. (Hence the 'ambiguity' of the title.) For example, the affricate [c] is sometimes treated as a sequence of /t+s/, sometimes as a geminate consonant −/tt/, /cc/ and occasionally /ss/. Evidence here is drawn from ablaut forms and play speech, though in the case of the latter, one may share the author's own reservations about data elicited primarily from an informant 'who was inventing individual forms on the spot for the benefit of the inquiring linguist'. However, he makes a more convincing case for recognizing two different analyses of the short vowel system, not at the level of pure formalization, but at the level of the native speaker's mental representation. In other words, he claims that variation can exist not only – as demonstrated so clearly by the work of sociolinguists – at surface level, but also at the level of abstract rule and representations. Drawing primarily on dialect-internal evidence, but also on evidence from other dialects and on historical data, he is sometimes able to suggest which of these competing rules or representations appears to be in the ascendant.